——Lord Walsingham writes us: "Noticing your mention of *Helia americalis* as a myrmicophilous Lepidopteron (AM. NAT., Oct., 1883, p. 1070), I would remind you of *Myrmicocela ochraceella* Tgstr., which is found also in ants' nests. It is allied to the true Tineæ.

ZOÖLOGY.

OWEN ON THE ASPECTS OF THE BODY IN VERTEBRATES AND INVERTEBRATES.[1]—The pineal and pituitary bodies, with the infundibulum, constituting what our author styles the conario-hypophysial tract, have been the theme of much discussion among naturalists. Some have seen in the pituitary, a gland secreting the intraventricular fluids of the brain, while others have believed it to be a remnant of an obsolete sense-organ.

To Professor Owen it is neither of these, but is the residuum of the deutostome, or invertebrate mouth, opening on the neural aspect of the animal and superseded in the vertebrates by a "tritostome" or hæmal mouth. In proof of this view he shows that in the lower mammals the pineal and pituitary bodies and their connections are larger and have a less parenchymatous and more tubular structure than in man; that in reptiles the pineal production perforates, as a rule, the parietal bone, but in some cases the suture between parietal and frontal; and that in fishes the relative magnitude and tubular character of this transcerebral tract are still more marked. In the skate the extension of the pineal part reaches beyond the cartilaginous roof of the brain-case, and in all Elasmobranchs it is an elongate tube, dilated at its peripheral end and maintaining its communication with the third ventricle, from the floor of which the infundibulum extends to join the pituitary body. In the brain of the Chimæra the cerebral masses are separated from the optic lobes by cord-like lamellæ equal in length to the structures they separate. These cord-like lamellæ seem to represent the crura cerebri, and the space between them, which is traversed by the pineal body and its connections, is the third ventricle. This structure seems to indicate that the crura cerebri are homologous with the parial cords which girt the gullet and connect the fore brain with the hinder masses in invertebrates. In the embryos of all vertebrates the pineal extension seems in quest of an open or oral outlet, but is checked by the external skin in lower forms, and by the cranial roof of the brain in the higher ones.

If it be admitted, with the great authority who, following in the line of Geoffrey St. Hilaire, advocates the "Unity of Organization" of the vertebrate and invertebrate kingdoms, that just as the umbilicus is the remnant of the protostome or primordial mouth, so the pineal body and its connections are the remnant in

[1] Aspects of the Body in Vertebrates and Invertebrates. By Richard Owen. London, 1883.

the vertebrate of the neurally situated mouth of the arthropod or mollusk, then the objections urged by Cuvier against the views of his great rival are answered, and the dorsal (hæmal) aspect of a caterpillar or crustacean must be considered to correspond with the ventral (hæmal) aspect of a vertebrate. Hæmal and neural must then be used in preference to dorsal and ventral, since the latter depend only upon the position of the mouth, neural in the Invertebrata, and separating the brain-ganglia to become so; and hæmal in the Vertebrata by the abortion of the portion directed neurad, and the connection of the alimentary canal with the invagination of the ectoblast.

The arguments in favor of the homology of the dorsal aspect of an insect with the ventral aspect of a vertebrate are certainly far stronger than anything which can be urged against them, yet there seems to be at least one important point in which the conario-hypophysial tract fails to correspond with the invertebrate gullet. The whole of the tract in question is situated anteriorly to the optic vesicle in the embryo and to the optic lobes in the adult. The homologue of optic lobes and nerves should, therefore, if this tract represents the invertebrate gullet, be found in the sub or neur-œsophageal ganglion of the invertebrate.

That this is not the case is clearly shown both by the diagrams and descriptions of Professor Owen. The supra-œsophageal or hæm-œsophageal mass, in both cephalopod and insect, contains the optic nerves and the brain-enlargement at their base. If, as our author asserts, in agreement with other anatomists, the eyes of the cuttlefish are the homologues of those of the lumpfish, must we not seek for traces of the invertebrate deutostome between the optic lobes and the hind brain, rather than between them and the cerebrum?—*W. N. L.*

FORBES' STUDIES OF THE FOOD OF ANIMALS.[1]—Some of the results arrived at by this investigation have already been reviewed in the NATURALIST. The first essay deals with the regulative action of birds upon insect oscillations, the second with the food relations of the Carabidæ and Coccinellidæ, the third with the food of the smaller fresh-water fishes, and the fourth treats of the first food of the common whitefish. The first brings out most clearly the fact that all passerine birds, even the seed-eating species, may be depended upon as aids against the canker-worm, and *presumably* against any other inordinately abundant insect; while the second shows that the Carabidæ are to a great extent vegetable feeders, the genera Harpalus and Anisodactylus especially; while the Coccinellidæ feed upon the spores of fungi, pollen-grains and plant-lice.

The so-called pirate perch (Aphredoderus), proved to feed

[1] Illinois State Laboratory of Natural History. Bulletin No. 6. Studies of the Food of Birds, Insects and Fishes. By S. A. Forbes.

almost entirely upon insects; sticklebacks eat about as much vegetable as animal substance; the small-mouthed atherinid *Labidesthes sicculus* is a purely animal feeder, dividing itself almost equally between insects and entomostracans; Fundulus and Zygonectes take but little vegetable food; the Cyprinidæ, with a long intestine and pharyngeal teeth with a broad grinding surface, feed principally upon vegetable food, ingesting much mud therewith; and in the Cyprinidæ, with hooked pharyngeal teeth and a short intestine, three-fourths of the food is animal. The smallest entomostracans form the first food of the young whitefish.

Exact observations of this nature are scarce, and of great value, and Mr. Forbes has begun a needed work.

SYMBIOSIS IN THE ANIMAL KINGDOM.—Professor Hertwig, according to *Nature*, at the last meeting of German naturalists, read a paper on this subject. This term, symbiosis, first suggested by De Bary in connection with certain phenomena of the vegetable world, is here extended to the whole organic system. As distinguished from ordinary parasitism, it is explained to mean the normal fellowship or association of dissimilar organisms which dwell together in a common abode for their mutual welfare. In the case of parasites the connection is altogether one-sided, one of the two organisms attaching itself to the other, and flourishing at its expense, as, for instance, the mistletoe on the apple tree. But in this newly-revealed phenomenon of symbiosis, which appears to pervade the whole biological world, both associates are mutually beneficial, and in some instances even indispensable to each other. They act, so to say, like two partners in a well-regulated business concern, coöperating in the work of life, taking part in all its toils and troubles, and honorably sharing the common profits. An illustration is drawn from the familiar hermit crab, one species of which, after taking possession of the first available empty shell, goes into partnership with a sea anemone (*Adamsia palliata*). This lonely creature, bright orange spotted with red, attaches itself to the roof of the common abode in such a position that its mouth and prehensile apparatus are always turned toward the head of its associate. It is thus enabled to join in all the expeditions of the restless hermit crab, and conveniently share in the common plunder. In return for this service, the anemone protects his companion from his many enemies by means of the numerous long threads which it shoots out at the least alarm, and which are provided with millions of capsules charged with a stinging acid like that of the common nettle. So close is the compact entered into by the two partners, that both have become indispensable to each other, as appears from a series of experiments made at the Neapolitan Aquarium. If the crab be removed from his house, and this be stopped up so as to prevent his reëntering it, he will cast about for another shell, and

never stop until his old associate is also transferred to their new abode. A still more remarkable illustration is drawn from the *imbauba*, or candle-nut tree of South America, which strikes up an alliance with a species of small black ant to their mutual benefit. The whole subject of symbiosis, which naturalists are only beginning to study, is calculated to throw great light on the Darwinian theory of biological evolution. The various cases of fellowship between animals and plants of different orders, and even between members of the animal and vegetable kingdoms, show how, in the perpetual struggle for existence, the individual organism avails itself of the smallest advantage to secure a place in the household of nature. It often thus acquires marvelous habits of life, which it is afterwards unable to lay aside, and in consequence of which it becomes gradually modified in its bodily form and organization. Thus *abyssus abyssum invoca*, one change superinduces another, altered conditions require fresh combinations, and the organic world resolves itself into an everlasting ebb and flow of life, in which the individual counts for nothing, the species—itself transitory—for but little, and the sum of existence alone is considered in the self-adjusting scheme of the universe. Symbiosis thus leads at once to a broader and more searching study of various branches of human knowledge. To prosecute the subject successfully vegetable and animal organisms must be examined, normal and morbid conditions attended to, anatomical and physiological questions investigated. For this boundless theme belongs to a border land in which zoölogy, botany, anatomy, physiology and pathology meet as on common ground.

Collecting and Preparing Infusoria.—Dr. H. Fol, in a fourth contribution to the knowledge of the family Tintinnodea, says that in the natural sciences, method plays a principal part; but it is nowhere of greater importance than in microscopical researches. Here the fitness of the investigator consists much less in any particular perspicuity than in the art of bringing into view the points that he wishes to know. Hence the employment of a new method has enabled him to see clearly many things which he had previously been unable to see, or which he had seen imperfectly and misunderstood. The collection of the Tintinnodea in the sea is an easy matter. There is no danger of damaging them at the moment of their capture, seeing that their test, into which they withdraw at the smallest sign of danger, sufficiently protects them. They are pretty robust and swim briskly about in the bottles several hours after their capture, and at a time when many delicate animals are already dead or disfigured. It is not, however, at the surface of the sea, or under a bright sun, that we find them in the greatest abundance. In cloudy weather they rise to the surface more readily than in bright weather, and in the daytime they are found chiefly at a depth of several fathoms. For

their capture he employed a net of fine muslin of a conical form, attached to a ring about 50^{cm} in diameter. The bottom of the net presents a contracted opening, like that of a "well," which opens at the middle of a much smaller net made of silken sieve-cloth, with very fine meshes. This latter is attached to a ring, equilibrated by a fragment of cork. This net of silken gauze does not injure the animals at all, and it captures at least twice as many as the glass bottle which some naturalists substitute for it. It is easy to understand, in fact, that the impermeable walls of the bottle compel the water to turn in its interior, and cause eddies, which carry out a considerable proportion of the captured animals.

With creatures so active and so difficult to observe alive under a high power, it is of great importance to have a process which enables them to be fixed instantaneously in their natural attitude before they have had time to withdraw into their test, and which preserves faithfully the details of their structure.

Dr. Fol tried the various reagents most in vogue without attaining his purpose. With weak osmic acid he did not succeed in preserving the cilia of the peristome; and with a stronger dose the body became absolutely opaque; in both cases there was always a strong contraction.

Acetic acid, chromic acid and picro-sulphuric acid only gave him a fixation which was too slow, so that the animal died contracted in the bottom of its test. Finally he "succeeded with a reagent which is not employed in histology, perchloride of iron;" by its means he has obtained a considerable number of specimens of various species, fixed in a state of full expansion. These subjects, washed with alcohol and treated with gallic acid, present a brown coloration which is especially localized upon the nuclei, and renders them very visible; the other parts of the animal acquire a light-brown tint, which renders them easy to see.—*Journ. Roy. Microscopical Society.*

How the Boring Sponge penetrates Limestone and Shells. — In an essay on the biology and anatomy of the boring sponge (Clione), by N. Nassonow, assistant in the Zoölogical Museum at Moscow, published in the *Zeitschrift für wissenschaftliche Zoölogie* for Nov. 6th, the author attempts to answer the question how the sponge forces its way into hard calcareous bodies, and how it accomplishes its work of destroying shells, corals, etc. His observations were made in May and June, 1881, at the biological station at Sewastopol. For a long time, he remarks, different species of this genus of sponges have been known to live in the shells of numerous mollusks, and in corals, while Oscar Schmidt has described two species living in limestone, and Hancock found on the coast of Northumberland almost every stone bored in all directions by different species of Clione. Finally,

Tscherniawsky commonly found in the Black sea very large stones which were perforated like a sieve by colonies of Clione; these worked in conjunction with numerous boring Nemertine worms, annelids and bivalves, so that the durability of stone piers, wharves and other marine structures was impaired.

The question then arises how the Clione bores its way into the hard calcareous structure. Does it go on in a chemical or mechanical way, or does the sponge simply settle itself in passages previously bored by other animals? We must, he says, consider *a priori* that the parasite sponges are supplied for this purpose with special means or facilities which are wanting in the free-living sponges. Hence arises the second question: How has the parasitic mode of life expressed itself in the structure of the body? Nassonow set himself to the task of answering these inquiries. To observe how they set at work, he bred the sponges from the egg, cultivating them on thin, transparent plates of lime, and in this way could observe the operations of the sponge by transmitted light.

On June 11th he noticed a number of embryo sponges which had attached themselves to the upper surface of these plates as minute, thin, yellowish, round spots. In this condition the young sponge begins its work of destruction. At first it appears as a rosette-like mark. The sponge sends out fine offshoots into the substance of the plate, following the lines which form the outline or lobes of the rosette. June 12th, the little sponge had sent its protoplasmic roots deeper and deeper into the plate, finally occupying the part of the plate which corresponded to the rosette. Toward evening the whole rosette-like spot had disappeared from the upper surface, and soon had formed a small circle of little pits, each pit corresponding to a single lobe of the rosette. The little sponge had compressed into the minute pits the greatest part of its body, but on the upper surface, near it, lay a heap of broken calcareous particles of ellipsoidal form, the under convex surface being cut by the rootlets of the body out of the substance of the shell or plate. In this way the sponge exercises a chemical[1] and mechanical destructive agency, with less expenditure of energy. Instead of dissolving each single particle of lime, it dissolves a thin calcareous layer which corresponds to the convex upper surface of the particle. That the work is cut down by aid of the spicules is proved by the fact that they do not exist at this early stage.

All the lobes (10–15) of the rosette become eaten out in one day. Hence it results that the destructive energy of a fully-grown sponge, with all its branches and galleries, occupying a very considerable surface, is naturally very great.

[1] The sponge bores its passages, in all probability, by secreting an acid. To detect the presence of the acid would be difficult on account of the strong alkaline reaction of the sea water.

The remainder of the paper is devoted to histological facts and an attempt to show the relations of the sponge structure to its parasitic mode of life.

POLYMORPHISM AND PARTHENOGENESIS IN MITES.—A. Berlese states that the adult Gamasus, like all parthenogenetic forms, produces viviparously hexapod nymphs, which never develop ova till they reach the mother-stage. Both the larvæ and the nymphs are distinguishable by their soft hyaline epidermis and the complete absence of any reproductive organs. There are nymphs which ought to become males, and others which should become females; and this, which is the most frequent arrangement, may be spoken of as the normal series. In addition there are individuals which cannot be produced by the adults or the higher forms of the series, but they are derived from two distinct groups, which, like the adults, are of the ordinary, or of the extraordinary series. Thus *G. tardus* produces a special larva from which, by rapid metamorphosis, there is developed a larger octopod nymph. During the whole of its development this form is octopod and asexual; it molts as it grows, but does not seriously alter in form; at the later molts a slight difference may be detected between the future males and females, but there are no traces of any secondary sexual characters.

A detailed account is given of the metamorphosis of *G. tardus*, *G. coleoptratorum*, *G. stabularis* and *Trachynotus inermis;* in the last of these pædogenesis is especially well marked.—*Journal of Roy. Micr. Soc., April.*

WATER-COLLECTING APPARATUS FOR MITES.—Mr. C. F. George states that he has used the following in searching for Hydrachnidæ, and has found no other piece of apparatus so efficient: A piece of thick brass wire is bent at about six inches from one end into a ring four or five inches in diameter. After connecting with some finer wire the two extremities of the ring, bend the stout wire at right angles to the ring, and continue it for about four inches. Then make another ring about one and a half inches in diameter, and there terminate the wire, leaving the small ring, however, not quite complete. The two rings will thus be parallel to each other. On the upper ring stitch a piece of tape, and to this sew a piece of muslin, made in the shape of a conical bag, and having its wider end affixed to the tape. Into the lower opening of this bag a small, wide-mouthed glass bottle, of about two ounces capacity, should be fastened by a piece of thread or fine string, and the lower ring is then sprung around the neck of the bottle. The other end of the brass wire, which was left projecting for about six inches, is now to be firmly lashed to a light cane or stick, and the apparatus is complete. In order to use the apparatus, move it gently backwards and forwards on the surface of the water, under the surface, or just above the bottom of the

pond, and among the weeds; the muslin will allow the water to pass through it, whilst any living organisms will be retained by the bottle. This can from time to time be examined with a pocket lens, and when it is found to contain anything, the lower ring of wire can be slipped off and the neck of the bottle pushed up through the upper ring, inverting the net. The contents may then be poured off into another bottle, and after rearranging the apparatus, fishing may go on again. The object of the piece of wire connecting the two ends of the net is to keep all stiff, so that the bottle can be turned in any direction, and yet both the upper and lower mouth of the net will remain open.

SPAWNING OF THE AXOLOTL.—Last year Mr. E. G. Blackford received two specimens of the Mexican laxolot *(Amblystoma mexicanum)*, which had been bred in France. They were albinos, as is often the case, and attracted much attention from visitors to Fulton Market. Last March the female laid many eggs—perhaps a hundred and fifty—and a few were hatched. To the surprise of all she has just laid another batch, but it is too soon to say if these will produce young. Some of the eggs have been sent to Mr. J. A. Ryder, of the U. S. Fish Commission, who will study their embryology if they prove to be fertile. We do not think it is generally known that this batrachian spawns twice a year.—*Forest and Stream.*

WHY SALAMANDERS ARE NOT EATEN BY FROGS.—About a year ago the writer captured a leopard frog in a meadow. It had not lost the direction of the water, for, on being pursued, it took long leaps toward the brook, which it could not see. It was brought home and a place prepared for it in a fern case. A vessel of water surrounded by moss and stones and growing ferns was covered by a large glass case. In this prison the frog passed the entire winter. He had for company two red salamanders and a younger brother of his own kind. The latter disappeared during the first day, eaten by the larger amphibian, and after him went every creeping and flying thing whose size would permit it to be swallowed, except the salamanders. It was amusing to see Rana undertake a meal of salamander meat. He tried it several times before he learned better. His little victim would almost disappear from view down the capacious gullet, but the pungent liquid thrown out from all parts of the body seemed too much for the frog's palate, and it was invariably ejected. After this trial of strength the three prisoners became great friends, and the salamanders would often crawl over the frog, he winking at their familiarity and rarely paying any attention to them.—*W. W. Thoburn in Scientific American.*

FOOD OF SNAKES.—When out after prairie chickens in August last, I crossed a large ditch which was all dried up except some small pools in which were large numbers of the common bream

or sunfish, *Pomotis vulgaris*, about one inch in length. In one of these pools two of the common garter snakes, *Eutænia sirtalis*, were catching these little fishes. Happening to pass the same place the next day, I found the pools dried up and the fish all dead. I was much surprised to see one of these snakes hastily moving away with one of the dead fish in his mouth. Is it common for these snakes to feed upon fish? Is it not uncommon for any serpent to take as food an animal already dead?—*E. A. Gastman, Decatur, Illinois.*

California Long-billed Marsh Wren.—June 18, 1882, a friend and myself started for Soap lake, San Felipe, with the intention of getting a few sets of eggs of this bird. Arriving there we pulled on our long boots and plunged into the tules in different directions. After an hour's hard work we returned and reported—one set of badly incubated eggs. My friend's experience was about the same as mine. I had found and examined some twenty-five nests, and of that number only three had been lined and used; two had been deserted, the third had the above-mentioned set. The other nests were of the same appearance outwardly, being woven of coarse bark of tules, but without the soft wooly lining of fine shreds of cotton tule and ducks' feathers. Some looked new, others old, and were situated, mostly, just out of reach in the taller clumps of tules. I saw but few birds, and these were fearless, approaching within two feet and looking me in the eye. Now, what can be the object of all these extra nests? Do the other birds build them for a shelter, and in case they are disturbed can immediately occupy another nest, or like children who build mud houses for amusement, and because they have nothing else to do? I hope to make another trip to the place when I have more time, and to be in better season.—*A. D. Butterfield, San José, Cal., in Oölogist and Ornithologist.*

Zoölogical Notes.—*Infusoria.*—The parasites found in the oysters of Arcachon and La Rochelle are the subject of a communication of A. Certes to the French Zoölogical Society. Among these are the following Infusoria: *Hexamita inflata* Dujardin, *Trypanosoma balbianii* Certes; a species of Enchelyodon which conjugates after developing actively by fissiparity, and after conjugation again becomes actively fissiparous, and *Prorocentrum micans* Ehrenberg.

Cœlenterates.—M. Mérejowsky has contributed to the Bulletin of the French Zoölogical Society an account of the development of Obelia. Before fecundation the eggs develop at the expense of the endodermic cells; the nucleolus takes the form of a chaplet bent upon itself, the grains of the chaplet separate and divide, and the ripe egg before fecundation does not present the least trace of a nucleolus in its entirely homogeneous nucleus. The blastula is composed of cells of very various sizes, its walls are

pierced by pores, and the endoderm is formed by the immigration, one by one, of the blastodermic cells, this immigration taking place only at the posterior part of the larva. In further development the ectoderm appears to be double, but this appearance is due to a differentiation in the protoplasm of the cells; and the gastric cavity appears first as a fissure in the center of the endodermic parenchyma. The perisarc of the hydroid form is very probably the product of the secretion of special unicellular glands, disposed in the ectoderm. The medusa does not necessarily die after it has laid its eggs. Under favorable conditions it lives, but changes in form, the umbrella relaxes, turns upwards, and ultimately forms a sac having a few tentacles around its narrow opening. Meanwhile the pendant manubrium loses its tentacles, and forms the base of the hydra-like animal, while the mouth narrows to a pore, by means of which the animal fixes itself. The cavities of the manubrium and of the larger sac formed from the reversed umbrella ultimately communicate, the ectodermic cells lining the latter each acquire a vibratile cilium and become endodermic, and the upper opening does duty for a mouth.——Dr. Otto Hamann (*Jen. Zeitschrift für wissenschaft.*, 1882) gives the results of his researches into the structure of the Hydrozoa. In the first chapter he treats of the various parts of these organisms; in the second of their polymorphism, the homologies between medusoid gonophores and medusæ, their embryology, the relationship between the hydroid polyps and the Siphonophora and Anthozoa, and their classification. He divides the entire class into the legions Hydropolypi and Coralpolypi, the first containing the orders Intæniolatæ, characterized by simple stomachs and polyps contained in capsules, and Tæniolatæ, with folded stomachs; and the second embracing the Milleporidæ and the Stylasteridæ. The numerous diverticula of an anthozoan are a complication of the foldings of the Tæniolata, and the anthozoan larva, with four septa, recalls the structure of the tæniolate Hydrozoa. In a second part Dr. Hamann goes more thoroughly into the histology and anatomy of some forms of Tæniolatæ and Intæniolatæ, and describes two new species (*Podocoryne haeckelii* and *Plumularia fragilis*). A third part is devoted to histiogenesis.——Another article by the same naturalist treats of the anatomy of the nettle capsules, etc., of Hydra. The researches were carried on at Heligoland and at the Naples Zoölogical Station.——Mr. R. E. C. Stearns describes a new Pennatulid from Japan under the name of *Radicipes pleurocristatus* (Proc. U. S. Nat. Mus., 1883, p. 96). This species has a furcate basal end, well adapted for fixation in a muddy bottom. Mr. Stearns also brings together numerous accounts tending to prove that Pennatulids with simple axial rods have considerable swimming powers. ——A recent memoir of the Museum of Comparative Zoölogy is devoted to the Porpitidæ and Velellidæ. Professor Agassiz

considers this small group of Hydrozoa, which is found wherever the influence of the Gulf Stream extends, to have greater affinity to the Tubularians than to the Siphonophoræ proper. *Velella mutica* is extremely abundant in the Straits of Florida, and sometimes finds its way north to Newport and Nantucket. It is larger than the Mediterranean species. The young differs greatly in appearance from the adult. The Florida Porpita, *P. linneana*, is also much larger than the Mediterranean species. In nearly all the Tubularians the base of the cœnosarc extends either as filaments or rootlets over a considerable space; these filaments are tubular, and, in Hydractinia especially, the base of the cœnosarc resembles in structure the float of Porpita. The great difference is that in the Porpitidæ and Velellidæ the extension of the cœnosarc is consolidated into a float from which the polyps depend.

Worms.—M. Megnin has contributed to the Bull. de la Soc. Zoölogique a study of the organization and development of Echinorhynchus, the most important result of which study is the proof of the existence in the larvæ of a well-developed digestive apparatus which atrophies without completely disappearing in the adult. In the latter the great development of the reproductive apparatus and the pronounced activity of the generative functions overshadow all other functions. The presence of a bifurcated intestine brings Echinorhynchus nearer the Trematodes and removes them from the Nematodes near which there was a tendency to place them.

Tunicates.—W. K. Brooks (Zool. Anzeiger, May, 1882) claims that the solitary Salpa is a true female, which produces a chain of males by budding and discharges an egg into each of them before birth. These eggs are impregnated while the zooids of the chain are very small and sexually immature, and they develop into females which give rise to other males by budding. Thus there is a remarkable difference in the mode of origin of the two sexes, but since both are the offspring of the solitary Salpa, one by budding and the other by sexual reproduction, it is not a case of alternation of generations. This view, first put forth in the Bull. Mus. Comp. Zoöl., No. 14, is again asserted in answer to Salensky, who claims that what Professor Brooks styled an ovary is but a mass of undifferentiated embryonic cells which gives rise both to the ovaries and to the digestive organs of the chain salpæ. Examination with a high power proves, however, that the organ is a true ovary containing eggs, while the digestive organs of the chain salpæ are not formed from it.

Crustacea.—In the Proc. U. S. Nat. Museum Professor S. L. Smith gives a list of the Crustacea dredged upon the coast of Labrador by the expedition under the direction of W. A. Stearns, and also gives a review of the marine Crustacea of that region,

including those collected by Professor Packard in former years. ——In the transactions of the Kansas Academy of Science F. W. Cragin gives the results of his studies of the Copepoda of the fresh waters about Cambridge, Massachusetts. After premising that the genus Cyclops has been the *bête noire* of American naturalists, since, though upwards of sixty valid species have been described in Latin, German, Danish, Dutch or Russian, only three were previously recorded from North America, he proceeds to identify six previously-described species, and to describe four more. The paper concludes with a translation of Poggenpol's descriptions of eight species of Cyclops.——The report by Mr. Harger upon the Isopoda dredged on the east coast of the United States during 1880, by the U. S. Coast Survey steamer *Blake*, contains descriptions of *Cirolana impressa*, *Rocinela oculata* and *Syscenus infelix*, all new species, and of four other little-known species.——MM. Regnard and Blanchard contribute to the Bulletin of the French Zoölogical Society proofs of presence of hæmoglobin in the blood of Apus. The blood of this crustacean is red, though less so than that of a vertebrate, and can be seen through the carapace at the anterior extremity of the animal. Spectroscopic examination showed that the red color is due to hæmoglobin, which is, however, as appears to be the rule in invertebrates possessing it, dissolved in the plasma.

Arachnides.—M. Megnin (Bull. de la Soc. Zoöl. de France) contributes some further information respecting *Cheyletus heteropalpus*, one of a group of Trombidians which live among the roots of the hairs of mammals, or under the feathers of birds, not to absorb the blood or the secretions of their hosts, but to chase and kill their real parasites. *C. parasitivorax* lives among the hairs of the rabbit in order to devour the Listrophores parasitic upon them, while *C. heteropalpus* and *macronychus* capture the Sarcoptidæ of birds. While dissecting a *Cardinalis fulgens* M. Megnin perceived numerous white spots upon the central part of the skin of the breast, and upon examination found them to be composed of fine interwoven fibers, covering a group of eggs in different stages, together with some recently hatched young which could be identified as *C. heteropalpus.*

Fishes.—Twenty-five new species of fishes from Florida are described in the Proceedings U. S. Nat. Museum (Sept., 1882), and Messrs. Jordan and Gilbert describe a new goby from Vancouver's island.——J. A. Ryder (Bull. U. S. Fish Commission, Sept., 1883) has a note on the thread-bearing eggs of Menidia. The eggs of this little fish have four long filaments attached to a small area on one pole; each of these threads is about eight times the length of diameter of the egg, and is apparently composed of the same tough material as that of the egg-membrane. These filaments uncoil from around the egg after oviposition, and as they have a

tendency to entangle with those of other eggs so as to form bunches or strings, Mr. Ryder suggests that they may be the means by which the parent fish is enabled to suspend its ova to the stems or leaves of plants. The ovary of a full-grown Menidia does not contain more than 300 eggs, while the silver-gar, the eggs of which have filaments scattered over the whole surface, contains 800 to 1000 ova. He notices that the number of ova produced by fishes is in some way proportioned to their chances of survival, and that in this respect species with thread-bearing eggs hold an intermediate position.——The same naturalist has an interesting notice of the breeding habits and development of *Amiurus albidus*, as exhibited by examples in confinement. The eggs were about 2000 in number, and formed a mass about eight inches long, four inches wide and one-half to three-fourths of an inch thick. Their surfaces were adherent but not gelatinous, so that intervening spaces remained between them for the passage of water. The female took no further notice of the eggs after depositing them, but the male watched carefully over them until the young had escaped from the egg-membranes, hovering over the mass and forcing fresh water through it by the rapid vibration of anal, pectoral and ventral fins. All of those left in his charge came out, while an attempt to hatch a portion of them artificially was less successful. The water-space in the egg was from the first filled with a great number of free corpuscles, a character not before met with (so far as Mr. Ryder is aware) in any other Teleostean egg. From the sixth to the eighth day the young were hatched, and on the fifteenth would feed. The parent fishes would often take into their mouths pieces of the liver thrown to the young, together with the young that were hanging to them, but it was observed that the young fishes were invariably ejected uninjured.——An elaborate and richly illustrated memoir of a hundred pages, on the brain of the lamprey eel, by F. Ahlborn, appears in the *Zeitschrift für Wissens. Zoologie* for Nov. 6. It treats not only of the morphology, but also of the cellular structure.——*Nature* records the fact that Mr. Morton states that *Ceratodus forsteri* in Mary's river, Queenland, from June to August goes in pairs, that they make slight indentations in the muddy bottom in from six to ten feet of water, in which the spawn is deposited; the male and female fish remain near the spawn, and are not then easily disturbed. They frequent the same place every year, and the spawn is like that of frogs. Mr. Morton has taken it and hatched it in a tub of water, keeping the young alive for some weeks.——In his paper on the oviducts of the smelt, in the Proceedings of the Zoölogical Society, Professor Huxley, after stating that, as is well known, Lepidosteus presents an example of a Ganoid with oviducts like those of the higher Teleostei; in the smelt, on the other hand, "we have a Teleostean with oviducts like those of the ordinary Ganoidei." He concludes that "there are no two

large groups of animals for which the evidence of a direct genetic connection is better than in the case of the Ganoids and Teleosteans. Two other supposed distinctive characters between these two groups have been shown to be not well founded, as Boas has recently discoverd a *conus arteriosus* in Butirinus and other bony fish, while a spiral valve was long ago discovered by Valenciennes in a bony fish (*Chirocentrus dorab*). Moreover, Huxley claims, with Balfour, that in the brain of Lepidosteus the epithalami "become exactly similar to the so-called 'cerebral hemispheres' of the bony fishes;" he then adds, "In all the Teleosteans, in fact, the bodies called 'cerebral hemispheres' are not the exact equivalents of the structures so named either in the higher Vertebrata or in the Selachians, but are *epithalami*, just as in the Ganoids. Thus, in cerebral structure, as in other respects, the Ganoids and the Teleosteans are as closely related to one another as they are different from the Selachians."

Batrachians and Reptiles.—Prof. E. D. Cope (Proc. Acad. Nat. Sci. Phila.) contributes considerable additional information respecting the geographical distribution of various batrachians and reptiles in Western North America. Among other results, the range of *Spea hammondi* is extended to the Rocky mountains, a new Scaphiopus is described from the Great Basin, and *Rana pretiosa* is proved to extend into that district. The Northern Pacific fauna, especially represented by *Bascanium vetustum*, *Rana pretiosa*, and *Bufo columbiensis*, extends in Idaho to the Rocky mountains. A comparison of the principal families and genera of cold-blooded vertebrata found in the Nearctic, Sonoran, and Neotropical regions is given, in order to show the far greater relationship of the Sonoran to the Nearctic than to the Neotropical.

Birds.—In the proceedings of the Zoölogical Society, Mr. W. N. Parker states that on the whole the respiratory organs of the South American ostrich (Rhea) very nearly resembles that of the Carinate birds; but in several points it shows an intermediate condition between the latter and Apteryx.——The Bulletin of the Nuttall Ornithological Club for Jan., 1883, contains, among other good articles, notes on a lateral hermaphrodite green-tailed towhee, though in plumage it resembled the females. B. F. Goss describes the breeding habits of Maximilian's jay and Clarke's crow, and G. Holtenhoff, Jr., describes the nest and eggs of LeConte's thrasher. ——Mr. N. C. Brown has found specimens of *Zonotrichia albicollis* unquestionably in their first year, but clad in a dress practically identical with that of the maturest spring birds. He also finds that males of the two North American species of Loxia often assume their full reddish dress in the autumn of their first year.——Polygamy in the blue bird and marsh blackbird is recorded by Professor F. E. L. Beal. In the April number the vernal migration of warblers on Wolf river, Wis., is described by F. L. Grundtvig.——A hybrid sparrow (*Zonotrichia albicollis* + *Junco hiemalis*) is discussed by

C. H. Townsend, while Mr. J. A. Allen notes certain exceptions to the law of increase in size northward among North American birds.——The July number contains faunal lists and notes, with some notes on habits.——Dr. Coues records, through G. F. Crook, a curious case of susceptibility of a caged red linnet to color. If anything blue is shown, it becomes terribly excited, and utters painful cries.——H. W. Henshaw records an instance of semi-domestication of the California quail, while F. Stephens describes a California bird-crane, *Dendrœca occidentalis*, being the most abundant migrants.——A supplementary list of the birds collected by Dr. Dybowski, in Kamtschatka, given in a recent issue of the Bull. de la Soc. Zoöl. de France, raises the total number, including the swimming birds, to a hundred and thirty-four. A new species of Astur, *A. candidissimus*, is described, also *Hirundo kamtschatica*, a species of Troglodytes, and *Phyllopseuste homeyeri*. ——In the Proc. U. S. National Museum, Mr. R. Ridgway describes *Psaltriparus grindae* and *Junco bairdi*, also a new variety of *Lophophanes inornatus*, all from the MS. of and from examples sent by Mr. L. Belding from Lower California. *Anthus cervinus* Pallas, before thought to be exclusively Asiatic, is also noted as occurring in Lower California.

PSYCHOLOGY.

INTELLIGENCE OF THE CAT.—One of the attractions of my home has ever been the number and variety of the pets we have kept, and to which liberty has generally been accorded. Thus they had an opportunity to develop their natures without great restraint; and I, to gratify my love for the observation of character in animals. Prominent among these pets were gophers, chipmunks squirrels—black, gray, red and flying—robins, mocking-birds, cats and dogs, which were entirely free, and a robin, several canaries, a fox, a bear, a bald-headed eagle, and several owls which were somewhat curtailed in their privileges.

As the intelligence of the cat has called forth some notice of late, let me add a few facts which have come under my observation. On introducing a new puss into the "happy family," I found that notwithstanding her reputed treacherousness and selfishness, a few kind, decided words, with considerable watching, and an occasional gentle spat, so well convinced her of the rights of others, that so far as those individuals are concerned in about two weeks she was conquered, and could be trusted to be in a room or out of doors alone with them. A young snipe being brought me, and all my efforts at taming it proving futile, for it *would* run away, I wanted the old cat to catch and have it. She would not touch it, helped us to "corner" it, but would not bite it, and after it was killed, she still refused to eat it, seeming to recognize it as one of her clan.

Many think cats have a memory of places only and not of per-